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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

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අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2020
General Certificate of Education (Ord. Level) Examination, 2020

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வடிவமைப்பும் இயந்திரத் தொழினுட்பவியலும் I, II
Design and Mechanical Technology I, II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

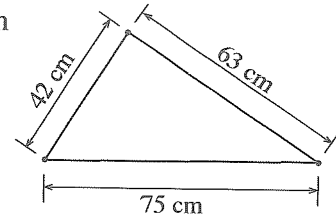
Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Design and Mechanical Technology I

Note :
- (i) *Answer all questions.*
- (ii) *In each of the questions* **1** *to* **40**, *pick one of the alternatives* (1), (2), (3), (4) *which is* ***correct or most appropriate.***
- (iii) ***Mark a cross* (X) *on the number corresponding to your choice in the answer sheet provided.***
- (iv) *Further instructions are given on the back of the answer sheet. Follow them carefully.*

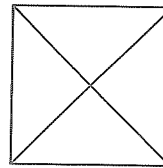
1. When the sides of the triangle shown in figure are unfolded to form a straight line, the total length is

(1) 105 cm.
(2) 117 cm.
(3) 138 cm.
(4) 180 cm.



2. The diagonals of a square are joined as shown in figure. The number of right angled triangles formed is

(1) 2. (2) 4.
(3) 6. (4) 8.



3. "The Locus of a point travelling at a uniform distance to a centre point is a circle." The most appropriate example to demonstrate this is

(1) a tyre revolving due to push.
(2) a revolving axis of a motor.
(3) the path of a bull tied to a sekku.
(4) the bucket and rope connected to the pulley of a well.

4. The internal angle of a regular polygon is 108°. What is the polygon?

(1) Regular pentagon (2) Regular hexagon
(3) Regular heptagon (4) Regular octagon

5. A thick A4 paper was folded to join the two wide ends without any additional activity. It will then form

(1) a section of a A5 size. (2) an irregular solid of no shape.
(3) a hollow cylinder. (4) a hollow pyramid.

[see page two

6. In a geometrical figure the front is rectangular, edges emanating from the four vertices drawn gradually inclining and forming a rectangle proportional to the front shape. The object thus drawn can be named
   (1) Rectangle. (2) Perspective view.
   (3) Isometric view. (4) Orthographic view.

7. What is called the property of a metal remaining unbroken and leaving elongated length the same when a metal wire is drawn in opposite directions?
   (1) Malleability (2) Fusibility (3) Ductility (4) Elasticity

8. What is the carbon percentage range in medium carbon steel?
   (1) 0.45 – 0.8% (2) 0.6 – 0.8%
   (3) 0.8 – 1.0% (4) 1.0 – 1.2%

9. The raw material fed into a blast furnace during production of pig iron includes limestones. What is this function of the limestones?
   (1) removing oxides in iron ore
   (2) mixing all raw material well
   (3) assist solidification of pig iron
   (4) raise the temperature inside blast furnace

10. What is the function of flux used in welding non-ferrous metals through oxy acetylene gas?
   (1) strengthen the weld
   (2) clean parent metal
   (3) fast melting of parent metal
   (4) delay melting of filling rod

11. What is the position to hold the welding rod in welding a side joint on a horizontal plane through arc welding?
   (1) flat ascent (2) cross ascent
   (3) horizontal ascent (4) vertical under hand ascent

12. Folding the edge of a metal sheet once only to strengthen the edge in sheet metal work is called
   (1) Plain seam. (2) Folded seam.
   (3) Wired seam. (4) Lap seam.

13. The diameter of a wire or the thickness of a sheet can be measured using Standard Wire Gauge (SWG). The thickness of a sheet matching SWG 16 is 1.63 mm. What is the thickness of a sheet matching to SWG 22?
   (1) 0.19 mm (2) 0.71 mm (3) 1.88 mm (4) 2.05 mm

14. What is the most appropriate number of teeth per inch in a hack saw blade for cutting a mild steel tube?
   (1) 18 (2) 20 (3) 22 (4) 24

15. What is the measuring instrument that can be used to measure internal dimensions, external dimensions and depth of a drill hole in mechanical technology work?
   (1) Micrometer (2) Vernier caliper
   (3) Internal bow caliper (4) Jenny caliper

16. Hard solder is a mix of copper and zinc. The ratio between copper and zinc in the Hard solder used should be changed according to the metal soldered. To solder which metal that hard solder with 70% copper and 30% zinc should be used?
   (1) Copper (2) Hard brass
   (3) Ferrous metals (4) Soft brass

[*see page three*

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17. What is the type of stake that can be used to bend a thin metal sheet at an angle of 30°?
    (1) Creasing stake (2) Beck iron stake
    (3) Anvil Stake (4) Hatchet stake

18. What should be used to adjust carburizing flame of a welding lamp in oxy acetylene welding?
    (1) equal quantities of oxygen and acetylene
    (2) less acetylene and more air
    (3) less oxygen and more acetylene
    (4) more oxygen and less acetylene

19. What is the identification colour of carbon dioxide fire extinguishers used for class 'A' fires?
    (1) Blue (2) Black (3) Cream (4) Red

20. In a relay with four terminals for horn circuit of vehicles, the terminals are named 85, 86, 87, 30/51. The 30/51 terminal should be connected to
    (1) positive terminal of battery. (2) terminal of horn.
    (3) horn switch. (4) ignition key.

21. Select the option showing motion transfer between Rack and pinion of the steering system of light vehicles.
    (1) Oscilating motion ⟶ Rotary motion
    (2) Resiprocating motion ⟶ Oscilating motion
    (3) Rotary motion ⟶ Linear motion
    (4) Linear motion ⟶ Resiprocating motion

22. After running how much distance the Spark plugs of motor bicycle engines should be replaced?
    (1) 5 000 km (2) 10 000 km (3) 15 000 km (4) 20 000 km

23. It was noticed that air bubbles are discharged from coolant in a vehicle with some defects observed, when the radiator cap was opened and engine was started. The reason for this could be
    (1) defective radiator. (2) defective gasket.
    (3) defective water pump. (4) defective hose pipes.

24. Select the option which includes the activity that the assistance of another person must be called for in repairing a hydraulic brake system.
    (1) Replacement of brake discs (2) Adjustment of brake shoes
    (3) Bleeding braking system (4) Replacement of wheel cylinder washers

25. What unsatisfactory condition could be created due to defective blower in an air cooled engine?
    (1) High consumption of fuel (2) Rise in engine temperature
    (3) Reducing the power of engine (4) Leakage of lubrication oil

26. What is the lubrication system applied for engines with side valve system?
    (1) Pressure feed system (2) Petroil system
    (3) Pump system (4) Splash system

27. It was observed that oily smoke emanates from the breather of an engine when started. The reason for this could be
    (1) worn piston rings. (2) worn pistons.
    (3) extreme hot engine. (4) raising lubricating oil.

[see page four

28. What is the most appropriate metal used for making engine cylinder liners?
(1) mild steel (2) high carbon steel
(3) aluminium (4) cast iron

29. Select the option which mentions parts of a magneto ignition system.
(1) Ignition armature, contact breaker points, capacitor, ignition coil
(2) Battery, ignition armature, contact breaker points, capacitor
(3) Generator, ignition coil, ignition armature, contact breaker points
(4) Secondary coil, ignition armature, capacitor, ignition coil

30. For fixing a spark plug to an engine the plug should be inserted into the plug hole and the maximum possible number of turns should be rotated by hand. Afterward what is the number of turns should be rotated inserting plug hole key in order to tighten further?
(1) $\frac{1}{4}$ (2) $\frac{1}{2}$ (3) $\frac{3}{4}$ (4) 1

31. What is the tool used for tightening bolts of an engine head in repairing an engine?
(1) Ring spanner (2) Double ended spanner
(3) Torsion wrench (4) Pipe wrench

32. Several shafts with cog wheels rotate in the gear box of a vehicle. What is the fastest shaft out of them?
(1) Top shaft (2) Main shaft (3) Lay shaft (4) Reverse shaft

33. What is the most reliable brake system out of the brake systems in vehicles?
(1) Mechanical brake system
(2) Main pump brake system
(3) Tandum pump brake system
(4) Semi mechanical and semi hydraulic brake system

34. What is the type of gear wheel used to transmit rotary motion provided from crank shaft to cam shaft in four stroke engines?
(1) Bevelled gear (2) Helical gear
(3) Double helical gear (4) Worm shaft and worm wheel

35. In a factory the workers are often subjected to accidents. The main fact for this could be
(1) use of electrical equipment without care.
(2) non availability of a First Aid Box.
(3) not following safety precautions.
(4) non location of fire extinguishers.

36. What is the option which mentions the parts of connection mechanism of the drive chain of a motor bicycle?
(1) Spring coupling, disc, flat spring
(2) Spring coupling, lock, seal
(3) Flat spring, nut, lock
(4) Flat spring, disc, frame

37. Select the option which mentions the lubricating oil path of a Pressure feed lubricating system in order.
(1) Pump, fine filter, mesh filter, main gallery
(2) Fine filter, pump, main gallery, mesh filter
(3) Main gallery, fine filter, mesh filter, pump
(4) Mesh filter, pump, fine filter, main gallery

[see page five

38. Velocity Ratio = $\dfrac{\text{number of cogs in driven wheel}}{x}$

What is indicated by x in the above formula?

(1) Diameter of drive wheel
(2) Speed of driven wheel
(3) Number of cogs in drive wheel
(4) Speed of drive wheel

39. It was observed that there is a time delay for engine temperature to attain working temperature than before. The reason for this condition could be .

(1) defective water pump.
(2) defective radiator cap.
(3) blocked pipes of radiator.
(4) defective temperature control valve.

40. The warning lamp of a running vehicle showed that the battery is not charging. What could be the reason for this?

(1) Broken fan belt
(2) Water passage blocks of radiator
(3) Reduction of water in cooling system
(4) No water in overflow tank

* *

[see page six

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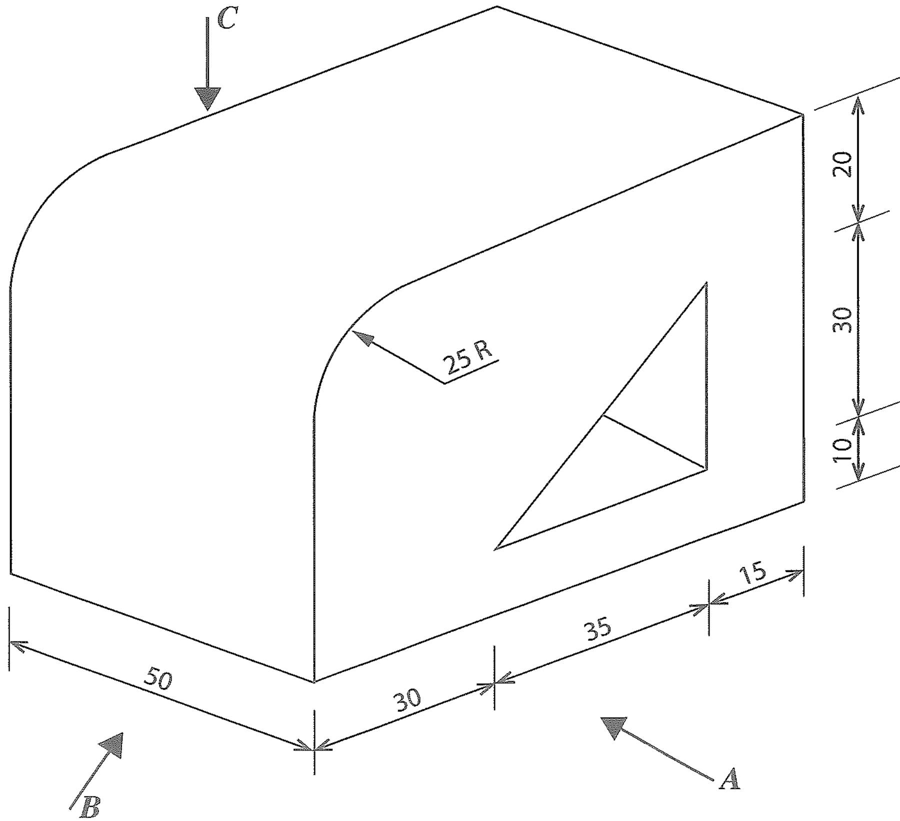
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வடிவமைப்பும் இயந்திரத் தொழினுட்பவியலும் I, II
Design and Mechanical Technology I, II

Design and Mechanical Technology II

* *Answer **five** questions only, selecting the **first** question and **four** others.*
* *Question No.**1** carries **20** marks and other questions carry **10** marks each.*

1. (i) Isometric view of an object is shown in the figure.



(All dimensions in millimetres)

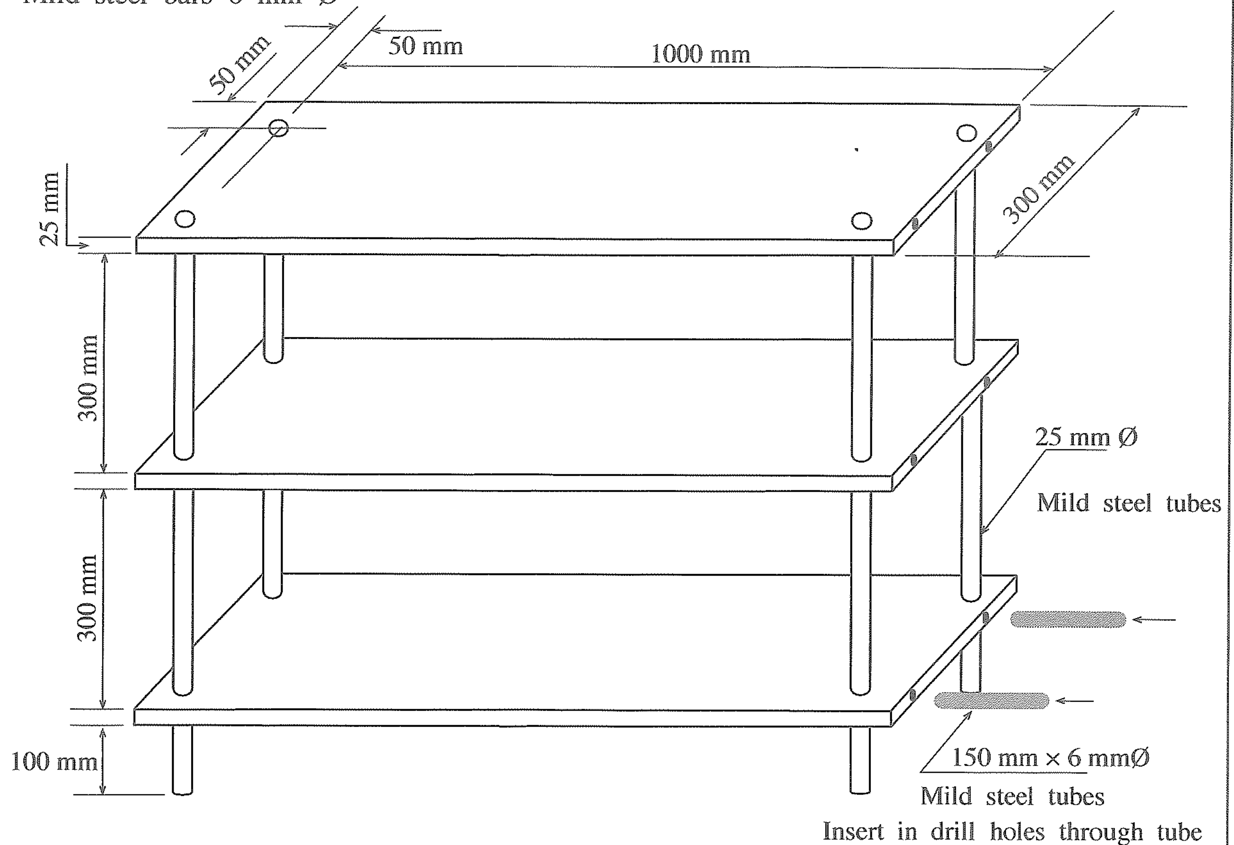
According to the isometric figure given above, draw
Front, elevation seen through direction of arrow *A*,
Side, elevation seen through direction of arrow *B*,
Plan, seen through direction of arrow *C*,
using third angle orthographic projection principles to a scale of 1:1 as per the dimensions.

(ii) Draw a circle of radius 30 mm and divide the circumference into **five** equal ports. Construction lines should be clearly shown.

[see page seven

2. For use in the school library, a rack should be made with detachable shelves as in the figure shown. Instructions have been issued to use the following resources available in the technological unit of the school, as to use

   Plywood sheets 25 mm thick
   Mild steel tubes 25 mm Ø
   Mild steel bars 6 mm Ø



(i) Write in the sequential order the steps you would follow to make the rack, with tools and equipment used for each activity.

(ii) Explain a strategy to be used in order to hold the shelves which could be removed by dismantling the 6 mm Ø mild steel bars so that no harm to its appearance occurs.

(iii) Design an alternative method to hold the shelves in position apart from the method shown in the figure. Draw a sketch, of the holding method showing only the holding method and location and name the parts.

3. Soft soldering is mostly used as a method of joining metal sheets together.

(i) Prepare a list of tools/equipments and materials required for soft soldering.

(ii) Mention **two** factors each comparing the differences and similarities between soft soldering and hard soldering.

(iii) Mention **four** other methods apart from soldering, that could be used to join parts of metal sheets together.

4. Orderliness, Cleanliness and Safety are important in a Mechanical Technology workshop.

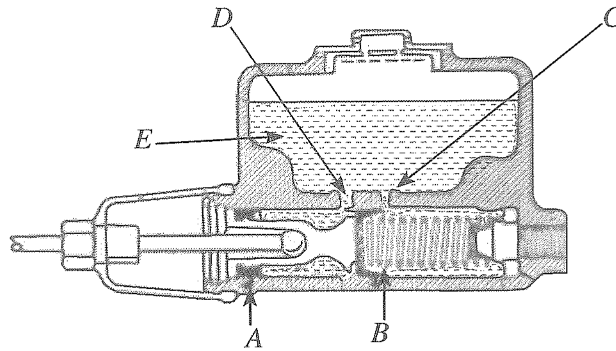
(i) Write **five** facts how orderliness and cleanliness of the workshop could be maintained.

(ii) Mention **four** safety precautions that should be followed in a workshop.

(iii) Write **four** factors necessary to maintain good industrial discipline in a workshop.

[*see page eight*

5. Different techniques are used to transmit power from one place to another in a machine or an assembly through transfer of motion.



(i) Name the parts *A, B, C, D, E, F* of the main pump of a hydraulic brake system shown in the figure.

(ii) Mention **four** methods used for power transmission.

(iii) Draw a sketch showing how a drive belt should be linked to rotate two pulleys in opposite directions for power transmission.

6. The electrical system of a vehicle fulfils many functions.

(i) Write sequentially the steps to be followed in removing and re-fixing a vehicle battery.

(ii) Write **three** reasons which could cause frequent fusing of the vehicle horn system.

(iii) Name the **two** types of batteries used in motor cycles and write **two** differences between them.

7. Government has taken steps to offer employment through vocational training to students who drop out from higher education after school education.

(i) Write a short note on National Vocational Qualifications (NVQ).

(ii) Name **four** institutions that function to provide proper vocational training to an apprentice.

(iii) Explain the procedure of obtaining a National Vocational Qualification (NVQ) through Recognized Prior Learning (RPL).

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